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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center">Office Action Summary</p>	Application No. 09/601,875	Applicant(s) TANGA ET AL.	
	Examiner BJ Forman	Art Unit 1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,7-16 and 22-41 is/are pending in the application.
- 4a) Of the above claim(s) 12 and 26-38 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 2 7-11 13-16 39-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the international Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 26 August 2003 has been entered.

Status of the Claims

2. This action is in response to papers filed 4 August 2003 in which claims 1, 2, 8-10, 13, 14 and 16 were amended. All of the amendments have been thoroughly reviewed and entered. The previous rejections in the Office Action dated 27 May 2003, not reiterated below, are withdrawn in view of the amendments. All of the arguments have been thoroughly reviewed and are discussed below as they apply to the new grounds for rejection. New grounds for rejection are discussed.

Claims 1-2, 7-11, 13-16, 22-25 and 39-41 are under prosecution.

Specification

3. The amendment filed 27 January 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

Independent claims 1, 13 and 16 have been amended to recite methods of making the substrate including:

“dipping the chip into a boiling alkali solution or steam” and “by dipping the chip into a solution containing a carboxyl radical or an epoxy radical.”

To support the “boiling alkali solution” Applicant cites “Example 2, page 120” (it is noted that the specification contains 26 pages and example 2 begins on page 9) wherein “boiling the test piece in sodium hydroxide solution” is taught. Sodium hydroxide, which is taught by the specification, is one species of the alkali solution genus. While the cited passage teaches a single alkali solution species i.e. sodium hydroxide, the passage does not teach the broadly claimed alkali solution genus. Therefore, the cited passage does not provide support for the amendment.

To support the recitation “dipping”, Applicant states that “dipping” is clearly used to mean that the chip is maintained within the liquid into which is it “dipped”. However, it is noted that the specification repeatedly recited “the test piece is set in a separate flask” (e.g. page 9, last two lines and page 12, lines 8-9). Webster’s Ninth Collegiate Dictionary defines “dip” as “to plunge or immerse momentarily or partially under the surface”. Webster’s Ninth Collegiate Dictionary defines “set” as “to place in or on”. Webster’s Dictionary clearly differentiates between the two verbs “dip” and “set”. While the specification recites setting the test piece in a flask, the specification does not teach or describe plunging or immersing

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momentarily or partially under a surface i.e. “dipping” as defined by Webster’s. Therefore, the term “dipping” is not described in the originally filed specification.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

35 U.S.C. 112: first paragraph

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-2, 7-11, 13-16, 22-25, and 39-41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The recitations “dipping the chip into a boiling alkali solution or steam” and “by dipping the chip into a solution containing a carboxyl radical or an epoxy radical.” are added to the newly amended independent claims 1, 13 and 16 (from which all claims depend). As detailed above, the specification fails to define or provide any disclosure to support the newly claimed recitations.

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MPEP 2163.06 notes "IF NEW MATTER IS ADDED TO THE CLAIMS, THE EXAMINER SHOULD REJECT THE CLAIMS UNDER 35 U.S.C. 112, FIRST PARAGRAPH - WRITTEN DESCRIPTION REQUIREMENT. *IN RE RASMUSSEN*, 650 F.2D 1212, 211 USPQ 323 (CCPA 1981)." MPEP 2163.02 teaches that "Whenever the issue arises, the fundamental factual inquiry is whether a claim defines an invention that is clearly conveyed to those skilled in the art at the time the application was filed...If a claim is amended to include subject matter, limitations, or terminology not present in the application as filed, involving a departure from, addition to, or deletion from the disclosure of the application as filed, the examiner should conclude that the claimed subject matter is not described in that application." MPEP 2163.06 further notes "WHEN AN AMENDMENT IS FILED IN REPLY TO AN OBJECTION OR REJECTION BASED ON 35 U.S.C. 112, FIRST PARAGRAPH, A STUDY OF THE ENTIRE APPLICATION IS OFTEN NECESSARY TO DETERMINE WHETHER OR NOT "NEW MATTER" IS INVOLVED. APPLICANT SHOULD THEREFORE SPECIFICALLY POINT OUT THE SUPPORT FOR ANY AMENDMENTS MADE TO THE DISCLOSURE" (emphasis added).

35 U.S.C. 112: second paragraph

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1, 2, 7-11, 13-16, 22-25 and 39-41 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claims 1, 2, 7-11 and 39 are indefinite in Claim 1, lines 16 and 17 for the recitations "with a hydrocarbon" because it is unclear whether the recitations modify the carboxyl and epoxy radicals or the solutions. Therefore it is unclear whether the radicals are attached to the hydrocarbon.

b. Claims 8-10 are each indefinite for the recitations "radical is introduced to a surface of said substrate with a titanium coupling agent or an aluminum coupling agent" because "introduced" is functional language and therefore it is unclear what structural limitations the

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introduction imposes on the substrate. Furthermore, it is unclear whether the titanium and/or aluminum are a component of the substrate.

c. Claims 13-15, 22-25 and 40 are indefinite in Claim 13, lines 10-11 for the recitations "with a hydrocarbon" because it is unclear whether the recitations modify the carboxyl and epoxy radicals or the solutions. Therefore it is unclear whether the radicals are attached to the hydrocarbon.

d. Claim 16 is indefinite in lines 9-10 for the recitations "with a hydrocarbon" because it is unclear whether the recitations modify the carboxyl and epoxy radicals or the solutions. Therefore it is unclear whether the radicals are attached to the hydrocarbon.

Claim Rejections - 35 USC § 102/103

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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9. Claims 1, 11, 13-16 and 25 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Chrisey et al (U.S. Patent No. 5,688,642, issued 18 November 1997) as defined by Sumiya et al (U.S. Patent No. 5,332,629, issued 26 July 1994).

Regarding Claim 1, Chrisey et al teach a solid state substrate for DNA immobilization (i.e. diamond) (Column 7, lines 24-28), wherein said substrate has a thermal conductivity ration of at least $0.1\text{W/cm}^\circ\text{K}$ as defined by Sumiya et al (Column 1, Table 1) wherein the surface of the substrate is modified by binding a chloride or hydroxyl radical (Column 7, lines 35-50) and wherein said substrate is used for immobilizing and amplifying DNA (Column 9, lines 22-27) wherein the substrate has a polar radical at a terminal on the surface of the substrate (Column 7, lines 35-50 and Fig. 4-5) and wherein said polar radical is hydroxyl radical, epoxy radical or amino radical (Column 7, lines 35-50).

The recitation “for amplifying DNA” in the preamble of Claim 1 and the recitation “for amplifying and immobilizing DNA” in lines 3-4 of Claim 1 are recitations of intended use for the claimed substrate. The courts have stated that a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). The intended use of the claimed substrate does not differentiate the claimed apparatus over the substrate of Chrisey et al.

The claim further recites the method steps by which the substrate is made. However, the courts have stated that “even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is

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unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) see **MPEP 2113**.

“The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature” than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, **the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product**. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983) (The claims were directed to a zeolite manufactured by mixing together various inorganic materials in solution and heating the resultant gel to form a crystalline metal silicate essentially free of alkali metal. The prior art described a process of making a zeolite which, after ion exchange to remove alkali metal, appeared to be “essentially free of alkali metal.” The court upheld the rejection because the applicant had not come forward with any evidence that the prior art was not “essentially free of alkali metal” and therefore a different and unobvious product.).

“[T]he lack of physical description in a product-by-process claim makes determination of the patentability of the claim more difficult, since in spite of the fact that the claim may recite only process limitations, **it is the patentability of the product claimed and not of the recited process steps which must be established**. We are therefore of the opinion that when the prior art discloses a product which reasonably appears to be either identical with or only slightly different than a product claimed in a product-by-process claim, a rejection based alternatively on either section 102 or section 103 of the statute is eminently fair and acceptable. As a practical matter, the Patent Office is not equipped to manufacture products by the myriad of processes put before it and then obtain prior art products and make physical comparisons therewith.” In re Brown, 459 F.2d 531, 535.

In the instant case, the substrate of Chrisey et al provides the polar radical at the substrate surface as claimed. Therefore, because Chrisey et al disclose the structural components of the substrate which define the claimed substrate (product), the instantly claimed is the same as that of Chrisey et al.

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The burden is on Applicant to show that the instantly claimed substrate is structurally either different from or non-obvious over that of Chrisey. It is suggested that Applicant provide factual evidence to support an allegation of non-anticipation or non-obviousness.

Applicants are advised that arguments of counsel cannot take the place of evidence in the record. In re Schulze, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965) (see MPEP 716.01(c)).

Regarding Claim 11, Chrisey et al teach said chip wherein DNA is immobilized to said substrate (Column 3, lines 20-25 and Column 7, lines 21-28).

Regarding Claim 13, Chrisey et al teach a solid state substrate having DNA immobilized thereon wherein said substrate is diamond and is chemically modified by binding a chloride or hydroxyl radical (Column 7, lines 21-50) and wherein said substrate is used for immobilizing and amplifying DNA (Column 9, lines 22-27). Chrisey et al do not teach the surface of the substrate is roughened. However, substrates having a roughened surface were well known in the art at the time the claimed invention was made as taught by Fodor et al (Column 37, line 65-Column 38, line 6). Specifically, Fodor et al teach a similar substrate for DNA immobilization wherein the substrate is modified by binding a hydroxyl radical (Column 37, lines 42-64 and Columns 43-44) and wherein the surface of the substrate is roughened (i.e. machined or etched) thereby increasing the surface area and increasing the density of reagent attachment (Column 37, line 65-Column 38, line 6). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the substrate surface of Chrisey et al by roughening the surface as taught by Fodor et al to thereby increase surface area of the substrate for the obvious benefits of increasing the density of reagent attachment and reagent-binding as taught by Fodor et al (Column 37, line 65-Column 38, line 6).

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Regarding Claim 14, Chrisey et al teach said substrate having DNA immobilized thereon wherein said substrate has a polar radical at a terminal of the surface of the substrate (Column 7, lines 41-50).

Regarding Claim 15, Chrisey et al teach said substrate wherein said polar radical is hydroxyl radical, epoxy radical or amino radical (Column 7, lines 35-50).

Regarding Claim 16, Chrisey et al teach their chip is for amplifying and immobilizing DNA (Column 9, lines 9-27).

The recitation “for amplifying and immobilizing DNA” is functional language and does not describe the claimed substrate in terms of structure. The courts have stated that claims drawn to an apparatus must be distinguished from the prior art in terms of structure rather than function see *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA1959). “[A]pparatus claims cover what a device is, not what a device does.” *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525,1528 (Fed. Cir. 1990) (see MPEP, 2114). Because “for amplifying and immobilizing DNA” does not describe structural components of the claimed substrate, the recitation does not distinguish the substrate over the prior art substrate.

Regarding Claim 25, Chrisey et al teach the substrate of Claim 15 wherein said polar radical is an epoxy radical and said epoxy radical is introduced to a surface of said substrate with a silane coupling agent (Column 7, lines 41-43).

Response to Arguments

10. Applicant argues that the substrates of Chrisey et al require organosilanes on the surface while the instantly claimed invention does not require the organosilanes of Chrisey et al.

The argument has been considered but is not found persuasive because the claims are drawn to a product i.e. a solid state substrate. The structural components of the claimed substrate include a diamond, synthetic diamond or diamond-like carbon substrate wherein

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said substrate is modified with a polar radical i.e. chloride, epoxy or hydroxyl radical. As stated above, Chrissey et al disclose the structural components of the substrate as claimed.

Applicant argues that in contrast to Chrissey et al, the instant invention uses a solution containing sodium sebacate, carbonic chloride, succinyl chloride or malonic acid wherein the carbonyl radical from one of the above binds to the surface of the substrate thereby providing a substrate bounded to a carboxyl radical with a hydrocarbon wherein the bond contains no silane. Applicant further argues that the instant invention provides a hydrocarbon chain and a carboxyl radical bonded directly to the surface of the substrate. The arguments have been considered but are not found persuasive because the arguments address limitations not recited in the instant claims e.g. "the bond contains no silane", "solution containing sodium sebacate, carbonic chloride, succinyl chloride or malonic acid", "substrate bounded to a carboxyl radical with a hydrocarbon", "a hydrocarbon chain and a carboxyl radical bonded directly to the surface of the substrate". Therefore, the arguments are not commensurate in scope with the instant claims.

Applicant states that "it is not understood why Fodor et al is used in an anticipation rejection, in which only one reference should be used rather than a combination of references." This comment is confusing because Fodor et al is not currently (and has not been) used in an anticipation rejection. It is assumed that Applicant is referring to the definition of thermal conductivity provided by the Sumiya et al reference. Applicant's attention is drawn to MPEP **2131.01** wherein guidance is provided for providing a defining reference.

Normally, only one reference should be used in making a rejection under 35 U.S.C. 102. However, a 35 U.S.C. 102 rejection over multiple references has been held to be proper when the extra references are cited to:

- (A) Prove the primary reference contains an "enabled disclosure; "
- (B) Explain the meaning of a term used in the primary reference; or
- (C) Show that a characteristic not disclosed in the reference is inherent.

See paragraphs I-III below for more explanation of each circumstance

Extra Reference or Evidence Can Be Used To Show an Inherent Characteristic of the

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Thing Taught by the Primary Reference "To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991).

Claim Rejections - 35 USC § 103

11. Claims 39-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chrisey et al (U.S. Patent No. 5,688,642, issued 18 November 1997) as defined by Sumiya et al (U.S. Patent No. 5,332,629, issued 26 July 1994) in view of Fodor et al (U.S. Patent No. 5,800,992, issued 1 September 1998).

Regarding Claims 39-41, Chrisey et al teach a solid state substrate for DNA immobilization (i.e. diamond) (Column 7, lines 24-28), wherein said substrate has a thermal conductivity ration of at least 0.1W/cm ° K as defined by Sumiya et al (Column 1, Table 1) wherein the surface of the substrate is modified by binding a chloride or hydroxyl radical (Column 7, lines 35-50) and wherein said substrate is used for immobilizing and amplifying DNA (Column 9, lines 22-27) wherein the substrate has a polar radical at a terminal on the surface of the substrate (Column 7, lines 35-50 and Fig. 4-5) and wherein said polar radical is hydroxyl radical, epoxy radical or amino radical (Column 7, lines 35-50).

Chrisey et al do not teach the surface of the substrate is roughened. However, substrates having a roughened surface were well known in the art at the time the claimed invention was made as taught by Fodor et al (Column 37, line 65-Column 38, line 6). Specifically, Fodor et al teach a similar substrate for DNA immobilization wherein the

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substrate is modified by binding a hydroxyl radical (Column 37, lines 42-64 and Columns 43-44) and wherein the surface of the substrate is roughened (i.e. machined or etched) thereby increasing the surface area and increasing the density of reagent attachment (Column 37, line 65-Column 38, line 6). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the substrate surface of Chrisey et al by roughening the surface as taught by Fodor et al to thereby increase surface area of the substrate for the obvious benefits of increasing the density of reagent attachment and reagent-binding as taught by Fodor et al (Column 37, line 65-Column 38, line 6).

Response to Arguments

12. Applicant argues that Fodor et al does not teach the instant invention. In response to applicant's arguments against the Fodor reference individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant further argues that Fodor et al adds nothing to the teaching of Chrisey et al because Fodor et al has nothing to do with bonding organic groups directly to a substrate and because Fodor et al uses ultraviolet light to remove protective groups. The arguments have been considered but are not found persuasive because the teaching of Fodor et al is drawn to providing a substrate for immobilizing DNAs. The teaching of Fodor et al is relevant to the fact that they roughen their substrate to increase surface area thereby increasing the density of reagent attachment and reagent-binding (Column 37, line 65-Column 38, line 6). As stated above, one of ordinary skill in the art would have been motivated to apply the roughened substrate of Fodor et al to the substrate of Chrisey for the expected benefit of increasing the density of reagent attachment and reagent-binding as taught by Fodor et al (Column 37, line 65-Column 38, line 6).

13. Claims 2, 7, 8 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chrisey et al (U.S. Patent No. 5,688,642, issued 18 November 1997) in view of Kobashi (U.S. Patent No. 5,77,372, issued 7 July 1998).

Regarding Claims 2, 7, 8 and 22-24, Chrisey et al teach a solid state substrate for DNA immobilization (i.e. diamond) (Column 7, lines 24-28), wherein said substrate has a thermal conductivity ration of at least $0.1\text{W/cm}^\circ\text{K}$ as defined by Sumiya et al (Column 1, Table 1) wherein said substrate is used for immobilizing and amplifying DNA (Column 9, lines 22-27) wherein said substrate is diamond (Column 7, lines 24-28) wherein said substrate is chemically modified by binding a hydroxyl radical to the substrate (Column 7, lines 41-50) wherein said substrate has a polar radical at a terminal on the surface of the substrate (Column 7, lines 35-50 and Fig. 4-5) and wherein said polar radical is hydroxyl radical, epoxy radical or amino radical wherein the polar radical is connected on a surface through an ester linkage, an amide linkage or introduced with a silane coupling agent (Column 7, lines 35-50). Chrisey et al do not teach said polar radical is a carboxyl radical. However, Kobashi teaches a similar a solid state substrate wherein said substrate is chemically modified to have a polar radical at a terminal wherein the polar radical is selected from the group consisting of hydroxyl, carboxyl, epoxy and amino (Column 10, line 63-Column 11, line 11). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the chemical modification of substrates as taught by Chrisey et al by chemically modifying with a carboxyl radical as taught by Kobashi based on the teaching of Kobashi wherein hydroxyl, carboxyl, epoxy and amino radicals function equally as chemical modifiers

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for diamond surfaces (Column 11, lines 4-11). The courts have stated with regard to chemical homologs that the greater the physical and chemical similarities between the claimed species and any species disclosed in the prior art, the greater the expectation that the claimed subject matter will function in an equivalent manner (see *Dillon*, 99 F.2d at 696, 16 USPQ2d at 1904). Therefore, one of skill in the art would be motivated to chemically modify the substrate of Chrisey et al with a carboxyl radical based on the similar chemical and physical properties of polar radicals taught by Kobashi (Column 10, line 63-Column 11, line 11) because one skilled in the art would have expected the carboxyl radical to function in an equivalent manner. Additionally, the skilled practitioner would have been motivated to modify the diamond substrate of Chrisey et al with a carboxyl radical based on the teaching of Kobashi wherein a biomolecule is immobilized via carboxyl radical-modification of diamond substrate (Kobashi, Column 10, line 63-Column 11, line 11).

Response to Arguments

14. Applicant argues that Kobashi et al adds nothing to Chrisey because while they teach radicals are used to modify a diamond substrate, they do not teach how the diamond should be chemically modified and therefore, the skilled practitioner would not have appreciated that a carboxyl radical along with a hydrocarbon chain could be bound to the diamond substrate. The arguments have been considered but are not found persuasive because as stated above, the claims are not clearly drawn to a diamond substrate bound to a carboxyl radical and hydrocarbon chain. Therefore, the arguments are not commensurate in scope with the claims.

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Additional Comments

15. Claims drawn to a substrate wherein the surface is modified to contain a polar radical selected from the group consisting of carboxyl, epoxy or amino and comprising a hydrocarbon wherein the radical is connected to the surface via a titanium coupling agent or aluminum coupling agent would be free of the cited prior art.

Conclusion

16. Claims 9 and 10 are free of the prior art of record and may be placed in condition for allowance following resolution of the above rejections under 35 U.S.C. 112.

17. No claim is allowed.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BJ Forman whose telephone number is (703) 306-5878. The examiner can normally be reached on 6:30 TO 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on (703) 308-1119. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 308-8724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0196.



BJ Forman, Ph.D.
Primary Examiner
Art Unit: 1634
October 22, 2003